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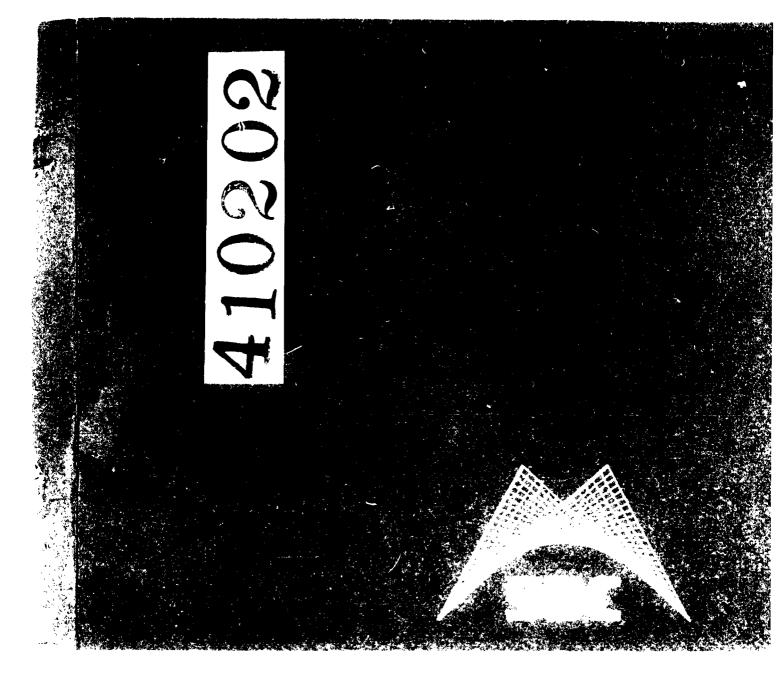
SCIENTIFIC AND TECHNICAL INFORMATION

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TM-745 001 00

Master Tape Control II (MTCII)

Operating Procedures

TM-745/001/00

# TECHNICAL MEMORANDUM

(TM Series)

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Master Tape Control II (MTCII)

Operating Procedures

Ву

Billie Rhae Pruett

and

William Taber

10 May 1963

Approved

J. A. Kneemeyer

SYSTEM

DEVELOPMENT

CORPORATION

2500 COLORADO AVE.

SANTA MONICA

**CALIFORNIA** 

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# PREFACE

This document is intended to satisfy the Milestone VII documentation requirements for Master Tape Control II (MTCII).

The CPL catalog number for MTCII is 75703.

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# INTRODUCTION

# Purpose of Document

This document, intended to give the level of detail necessary for programmers and computer operators to manipulate the COPII System efficiently, is divided into six sections. The first section includes a list of objectives of MTCII, a summary of the functions of the control program, a brief description of the system storage device, function requests and system control cards. The second part defines the input and output of the control program as well as an explanation of equipment references. All the information pertinent to the operation of the system, i.e., the control features, is described in the next section. This includes tape assignments, console switch settings, on-line messages, halts, starts and restrictions. The primary section of the document is an explanation of the preferred operating procedures for the MTCII System. Illustrations of sample jobs are given to aid the operators in learning the system. Terms used frequently are defined in the glossary.

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# SYSTEM DESCRIPTION

# 1. MTCII Description

MTCII, the Master Tape Control Program II, is the executive component of the 1604 Satellite System. The program is written to operate with a Master Tape as a storage device for all system elements. The basic operation of MTCII consists of loading and executing a requested function. The following tasks are performed by MTCII.

- a. A function request is accepted from one of the input modes typewriter, cards or magnetic tape.
- b. The parameters and modification numbers from the function request are converted and stored.
- c. A calling sequence for the function is generated containing the parameters and modification numbers.
- d. The function request is output on the printer and on the system output tape.
- e. Subroutines required by the requested function are determined.
- f. Storage locations are assigned to the function and its subroutines unless the routines are already in memory.
- g. If requested, an area of memory is reserved as a communications buffer.
- h. If requested, an analysis of the storage area required by the function and its subroutines and a list of the correctors are output.
- i. The function and its environment are loaded from the Master Tape.

- j. Correctors are stored for specified routines.
- k. The requested function is executed by means of the "MTCII generated calling sequence."
- 1. A special table is allowed to control the sequence in which functions are operated.
- m. Providing complete input-output routines for the use of system elements.
- n. Provisions for clearing specified areas of core, timing functions, temporarily defining new routines, redefining existing routines and correcting existing elements are also made.

# 2. Master Tape

All the elements of the COPII System are contained in one file on the Master Tape, a magnetic tape which is always on Channel 3/4, Cabinet 2, Unit 1, This file consists of a bootstrap routine, an executive control program, a reference pool, a directory, functions, subroutines, tables and buffers. Each of these elements is contained in a separate record in relocatable binary, absolute binary or straight binary format. The format of the tape is as follows:

Record 1	BOOTSTRAP
Record 2	MTCII
Record 3	DIRECTORY
Record 4	REFERENCE POOL
Record 5	lst ELEMENT
Record 6	2nd ELEMENT
Record N+3	LAST ELEMENT
	END OF FILE

# Where:

- Record 1 Contains the bootstrap routine. When the Auto-Load button is depressed, this record is automatically read into memory starting at Location 00002. The bootstrap routine then loads the second record from the Master Tape and gives control to MTCII.
- Record 2 Contains MTCII. MTCII is the control program described in the previous section which controls the operation of function requests.
- Record 3 Contains the directory which defines the contents of the Master Tape. The directory contains information for each record on the tape (except the bootstrap) and includes the name of each element, its position on the tape, a flag indicating the mode of the record (absolute or relocatable), the length or starting address of the element and a list of all subroutines required by the element.

Record 4 - Contains the Reference Pool which consists of a communication area, temporary storage and constants.

Record 5 - An element can be a function, subroutine, table or through buffer. A function is defined as a closed subroutine which may be called by a function request as well as an internal sequence. A subroutine is a set of computer words which perform a certain operation from parameters input through a calling sequence, and usually is called through an internal calling sequence because this calling sequence is generally not compatible with the MTCII generated one. A buffer is a section of memory that has been set up for storage of information, usually used in connection with input and output.

# 3. Function Requests

The request for a function may be by the on-line card reader, typewriter, or magnetic tape. The normal mode of operation utilizes the on-line card reader; however, if typewriter control is desired, Selective Jump Switch I must be set. Magnetic tape as an input source must be activated by means of a pseudo function, \*TAPERD. The request format for the different modes of operation is essentially the same; it is in the "free field" format; i.e., any number of blanks or spaces may separate the fields as long as there is at least one blank or space. There is a limit of one request per card, typed line, or prestored tape record. The format is as follows:

\* N1 N2 N3 N4 FUNCTION P1 P2 . . . Pp , \$ M1 M2 . . . .  $M_{m}$ 

Where:

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Identifies the card as a function request and <u>must</u> be in Column 1 (or the first character of the typed line).

N1 Is the unit number in decimal or octal of the equipment on which a storage analysis, list of corrector table, and interrupt messages are output. N1 must be a number in the range 2-14 or 16-19. N1 must be present if N2 is specified.

N2 Is a decimal or octal number less than 10000B which designates the number of arithmetic fault messages to be output. After N2 fault indications, no more messages will be output. If N2 is specified, N1 must precede it. If N2 is equal to zero, interrupt on arithmetic faults is deselected.

Is a decimal or octal number greater than 10000B, the BCI word "RCIANK" or the BCI word "CIANK." N3 designates the starting location of the requested function. If N3 is a decimal or octal number, MTCII will be initialized and the current location counter (CIANK) will be equated to N3. If N3 is "CIANK," MTCII will not be initialized and the function will load at the current setting of CIANK. If N3 is "RCIANK," MTCII will be initialized and the function will be loaded at the current setting of the reset location counter (RCIANK). The area from 10000B to N3 will not be destroyed. The environment of the function will be assigned addresses following the function.

Is a BCI character equal to the letter "X" if the function is to be loaded but not operated and is blank if the function is to be operated.

N4

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FUNCTION Is the name of the requested function in BCI (up to eight characters).

P1-Pp Are the parameters required by the requested function.

M1-M<sub>m</sub> Are the mods or variations required by the requested function.

A comma preceded and followed by a blank separates the parameters and mods.

\$ A dollar sign is the continuation symbol which indicates a multi-card function request.

The maximum number of parameters and mods is 75.

# 4. System Control Functions

There are fifteen pseudo functions in MTCII.

# a. CARDS

The CARDS pseudo provides a means by which a new program element may be defined, an existing element may be redefined, or existing elements and reference pool items may be corrected. The format of the CARDS pseudo is:

## \* CARDS Pl

where Pl is an octal or decimal number greater than 10000B; the ECI word "RCIANK" or the ECI word "CIANK." Pl is the address where the first defined function will be loaded. If Pl is "CIANK," the first defined function will be loaded at the current value of CIANK. If MTCII is in the Special Operating Mode and Pl is "RCIANK" then the first defined function will be loaded at the current value of the Reset Location Counter (RESETC).

All functions above Pl will be destroyed. This mode of operation is terminated by the next function request card. For this reason a number of routines may be defined and corrected at one time.

There are only two legal mode cards which may follow the \* CARDS card, DEFINES and CORRECT.

# 1) DEFINES Mode

This mode is used when it is necessary to temporarily define a routine. Following the mode card there must be a deck of binary, octal, alphanumeric, free field, and/or decimal cards whose last card is a termination card (a binary transfer card or a non-binary card with a 12 or 11 overpunch in Column 1).

The format of the DEFINES card is:

# DEFINES FUNCTION P1 P2 P3 P4

# Where:

Defines	Must be in Column 1-7.
Pl	(Optional) is a flag which, if present, is
	equal to the letter "F" to indicate that the
	function is absolute. If Pl is not present,
	the function is considered relocatable.
P2	Is equal to the octal starting location of
	the function if Pl = F. If Pl is not present,
	P2 is equal to the octal length of the re-
	locatable function. P2 is assumed to be octal,
	but a "B" may follow the number.
B	(Optional) is the unit number in decimal or
	octal of the binary tape output by LARII from
	which the binary program is to be read. The
	legal values for P3 are 2, 4-12 and 16-19.

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P4 (Optional) is a flag which, if equal to "C," indicates the presence of correctors from the current input source. If P4 is not present, it is assumed that there are no correctors.

# 2) CORRECT Mode

This mode is used when it is necessary to temporarily correct an element or an item in the reference pool. The format of the CORRECT card is:

# CORRECT FUNCTION

Where:

CORRECT Must be in Column 1-7.

FUNCTION Is the name of the element to be corrected or POOL for a reference pool item.

The formats of binary, octal, alpha-numeric, free field and decimal cards are given in Section 07.06.01.

### CLR ъ.

The CLR pseudo function is used when it is desired to clear some portion of memory and start the system without reloading the control program. The format for CLR is:

# \* CLR P1 P2 P3

Where:

P1 (Optional) is equal to the letter "C" if the corrector table is to be preserved; otherwise. this field is blank.

P2

**P**3

(Optional) is an octal or decimal number; the BCI word "RCLANK" or the BCI word "CLANK."

If P2 is an octal or decimal number, memory will be cleared beginning at this value and MTCII will be initialized. If P2 is "RCLANK," memory will be cleared beginning at the current value of RESETC, if MTCII is in the Special Operating Mode, and MTCII will be initialized. If P2 is "CLANK," core will be cleared beginning at the current value of CLANK and MTCII will not be initialized.

(Optional) is the location at which the clearing operation will be terminated. If P3 is specified P2 must be specified.

P2 and P3 must be greater than or equal to 10000B.

# c. \* FINIS

This pseudo function is used when it is desired to indicate to the operator that a job is complete or that special instructions are to be followed. A halt occurs and if the operator hits start, MTCII will be loaded from the Master Tape. This pseudo is not to be used following \* EOT 3.

# d. TAPERD

This pseudo function is used when it is desired to read function requests from magnetic tape. The format of the TAPERD pseudo is:

# \* TAPERD P1 P2

# Where:

Pl Is the unit number in decimal from which the requests are to be input. Pl = 0 for the card reader, Pl = 2, 4-12, 16-19 for magnetic tape,
Pl = 14 for the typewriter.

P2 Is equal to "P" if the unit number specified by
P1 is to remain the input source until the source
is changed by another TAPERD pseudo or an EOF.

If P2 is blank, only one function request is read
from the source indicated by P1.

# e. CODES

The CODES pseudo function outputs the name of each element listed in the codes table in the order that each occurs in that table. The format for CODES is:

# \* N1 CODES

# Where:

N1 Is the logical unit number of the output equipment.

If the output is on-line, then N1 may be omitted.

The codes table is used by MTCII, IARII and PMTII and is a means by which subroutine references are made. Each routine has a relative number in this table and if a function calls a routine, a number is substituted by IARII for the reference. At load time, MTCII decides what address this routine will have and at this time substitutes the address for the CODES number. PMTII also uses this table to pass information via the directory to MTCII indicating all subroutines needed by each element.

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# f. DIR

This pseudo function outputs the name and/or environment of each element on the Master Tape in the order that the elements occur on the tape. The format of the DIR pseudo is:

# \* DIR P1 P2 P3

# Where:

Pl Is the unit number for directory or environment listing.

P2 Equals "D" for a directory listing; equals "ND" for no directory listing.

P3 Equals "E" for an environment listing; equals "NE" for no environment listing.

# g. WEOF

This pseudo function writes an end of file mark on the specified tape units. The format for WEOF is:

\* WEOF N1 . . . Nn

Where:

N1-Nn Are the logical tape unit numbers.

# h. REWIND

This pseudo function rewinds without interlock the specified tape units. The format for REWIND is:

\* REWIND N1 . . . Nn

Where:

N1-Nn Are the logical tape unit numbers.

### i. \* REM

This pseudo function is used to output remarks on the on-line printer and the System Output Tape.

### j. \* RERUN

The purpose of the RERUN pseudo is to initialize sequence checking while in the SOM. It allows the rerun of functions that require sequencing. In order to use the RERUN pseudo, the requests for the functions to be rerun must follow the RERUN pseudo and must be in proper sequence.

### \* HALT k.

This pseudo function is used when it is desired to interrupt a job for operator action. A halt occurs and if the operator hits start, MTCII will return to the control cycle. MTCII will not be reloaded as in the case of the FINIS pseudo.

### REDEFINE 1.

The purpose of the REDEFINE pseudo function is to temporarily change the length or starting location of an element in the directory. The redefinition of a directory entry is effective until a fresh start is made; i.e., a start from BOOT or from pressing AUTO-LOAD. The format is:

# \* REDEFINE FUNCTION P1 P2

# Where:

FUNCTION Is the name of the function to be redefined.

Is "F" if the function is absolute and "R" if the Pl function is relocatable.

**P**2 Is the length if the function is relocatable and is the starting location if the function is absolute.

# m. SIMTEST

The purpose of the SIMTEST pseudo function is to either begin or end the simulation test mode. While in the simulation test mode all requests for CPC, CURCHECK, CHCKBIT2, CURCHEX will be replaced by their simulation counter parts. The format of the pseudo is:

# \* Po SIMTEST Pl P2

# Where:

P<sub>O</sub> (Optional) is "OFF" to end the simulation test mode and blank to begin the simulation test mode.

Pl Is the input tape number, 0, 2-12, 16-19 are legal values.

P2 Is the output tape number 0, 2-12, 16-19 are legal values.

# n. STCP

This pseudo conditions MTCII to operate with the Parameter Test System (PTS). The format of STCP is:

# \* STCP UNIT

# Where:

UNIT Is the logical tape unit number for the prestored PTS control cards.

# o. CLOK

This pseudo will time a portion of a function, an entire function, a function including load time, or a group of functions. The format for CLOK is:

# \* CLOK Pl P2 P3

# Where:

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Pl Is "ON" if the clock is to be cleared and started.

Is "OFF" if the clock is to be stopped and the time for the ON-OFF period output.

P2 Is the logical unit number of the output device 2-12, 16-19 for magnetic tape, 13 for the printer and 14 for the typewriter.

P3 Is an "F" for function time, and "L" for function time including load time and "FL" for function time and function time including load time.

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# 01.03.01

# INPUT/OUTPUT

# 1. Input

The two system inputs include a master tape and function requests.

- a. The Master Tape contains all the elements, control program, etc., to operate the Satellite Control System. This tape must always be on the tape drive Channel 3/4, Cabinet 2, Unit 1 because the Auto-Load button automatically selects this tape unit.
- b. Function requests are the means by which programs are called and executed by the MTCII control program. These requests may be input from any of three modes: typewriter, cards or magnetic tape. The card source is the standard mode of operation.

# 2. Output

- a. Function requests are always output on Unit 3 and on the printer.
- b. If a unit number is specified on the function request, a storage analysis and the corrector table are output on the specified unit. Fault conditions are also output, if they occur.
- c. Error messages are output on the printer. Special Operating Mode messages are output on the printer and Unit 3.

# 3. Equipment Assignments

In the COPII System all on-line equipment is assigned a unit number and reference is made to a specified equipment by this number. These numbers are defined as follows:

	UNIT	EQUIPMENT
	0	088 Card Reader and 523 Card Punch
	۲۱	Magnetic Tape - Channel 3/4, Cabinet 2, Unit 1
Logical	2	Magnetic Tape - Channel 3/4, Cabinet 2, Unit 2
Tape	< 3 €	Magnetic Tape - Channel 3/4, Cabinet 2, Unit 3
Unit	4	Magnetic Tape - Channel 3/4, Cabinet 2, Unit 4
	_ 5	Magnetic Tape - Channel 3/4, Cabinet 3, Unit 1
	Γ6	Magnetic Tape - Channel 3/4, Cabinet 3, Unit 2
	7	Magnetic Tape - Channel 3/4, Cabinet 3, Unit 3
Logical	8	Magnetic Tape - Channel 3/4, Cabinet 3, Unit 4
Tape	₹ 9	Magnetic Tape - Channel 1/2, Cabinet 2, Unit 1
Unit	10	Magnetic Tape - Channel 1/2, Cabinet 2, Unit 2
	11	Magnetic Tape - Channel 1/2, Cabinet 2, Unit 3
	12	Magnetic Tape - Channel 1/2, Cabinet 2, Unit 4
	13	1612 Printer - Channel 2
	14	Typewriter - Channel 1/2
	15	Paper Tape - Channel 1/2
	Г16	Magnetic Tape - Channel 5/6, Cabinet 2, Unit 1
Logical	17	Magnetic Tape - Channel 5/6, Cabinet 2, Unit 2
Tape	18	Magnetic Tape - Channel 5/6, Cabinet 2, Unit 3
Unit	19	Magnetic Tape - Channel 5/6, Cabinet 2, Unit 4

There is an internal table in MTCII called TTTT which has a one-word entry for each unit in the system. This table is of interest to the operator because if an entire channel or even a tape unit is inoperable, the entry(ies) in TTTT can be modified so that another tape may be used for a particular unit. In this manner only MTCII need be changed, not the programs using the disabled units. A detailed description of the TTTT table is given in the appendix of TM-745/000/01.

# SYSTEM OPERATION

# 1. Tape Assignments

There are three tapes used by the COPII control program:

Unit 1 - Master Tape

Unit 3 - System Output Tape

Unit N - Prestored Function Request Tape where N is the unit desired (optional)

# 2. Jump and Stop Switches

Selective Jump Key 1 is used by MTCII to determine the input source for function requests:

SLJ 1 - Set position - typewriter input

SLJ 1 - Unset position - card input (standard mode)

Selective Stop Key 1 is used by MTCII to determine whether to operate the requested function.

SIS 1 - Set position - halt prior to operating function

SLS 1 - Unset position - operate function

# 3. Informational Messages

Informational messages are not accompanied by halts. They are divided into five groups: identification of the Master Tape and the control program; definition of the Special Operating Mode; a log of elapsed time; indication of interrupts; log of the CARDS mode requests.

# a. Identification

The identification messages are output on the 1612 Printer and the System Output Tape.

1) Message: xxxxxxxxxxxxxxx UTILITY
MASTER xxxx MOD xx DD MMM YY
FLIGHT xxxx MOD xx DD MMM YY

Explanation: The tape identification message is formatted from the information contained in the bootstrap record. The first two words of the message are the tape descriptor. The utility and/or flight number, mod and date are given. This message is output when the system is initialized by either depressing autoload or executing a start from BOOT.

2) Message: MTCII xx HAS BEEN AUTO-LOADED

Explanation: This message is output to indicate the control program is auto-loaded and to give the mod number of the control program; e.g., xx = AG.

3) Message: MTCII xx HAS BEEN RE-LOADED

Explanation: This message is output each time the control program is reloaded. xx is the mod of MTCII, e.g., AG.

4) Message: THE DIRECTORY HAS BEEN RE-LOADED

Explanation: This message is output each time the directory record is re-loaded from the Master Tape.

b. Special Operating Mode

The messages that define the Special Operating Mode are output on the 1612 Printer and the System Output Tape.

MTCII.

1) Message: SPECIAL MODE x NOW COMMENCING

Explanation: This message indicates that Mode x is now being initiated. x is a number from 1 to 5 and refers to the table defining the Special Operating Mode, i.e., SPETABX.

2) Message: THE TABLE OR BUFFER, XXXXXXXXX, HAS BEEN ASSIGNED THE AREA FROM 10000B to YYYYY

Explanation: This message denotes the name of the element and the area reserved for it which will be retained during the SOM.

- 3) Message: THE CURRENT LOCATION COUNTER RESET VALUE IS

  Explanation: The purpose of this message is to log the address at which the continuous loading area will start while in the SOM.
- HAS BEEN LOADED AND OPERATED

  Explanation: This message is output when the SOM is initiated if a function to be operated is specified in SPETAEX. It denotes the name of the function that was operated automatically by MTCII.
- 5) Message: EXIT FUNCTION HAS BEEN OPERATED

  Explanation: This message is output prior to termination of the SOM if a function was specified in the SPETABX and indicates the name of the function that has been automatically operated by
- 6) Message: SPECIAL OPERATING MODE x IS NOW TERMINATED

  Explanation: The message denotes the particular SOM, X, that has been terminated.

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# c. Elapsed Time

The "elapsed time" messages are output only when requested via the CLOK pseudo or subroutine. The output unit for the following messages is specified in the CLOK calling sequence or request.

1) Message: ET FOR PART OF \_\_\_\_ = HR MIN SEC . xx

Explanation: This message is output when an OFF request is made to the CLOK subroutine. The elapsed time (ET) is given for part of the indicated function from the time the CLOK ON request was made until CLOK OFF was requested. ET is given in hours, minutes and seconds.

2) Message: ET FOR = HR MIN SEC . xx

Explanation: This message is output when requested by the pseudo CLOK with P3 = "F" or "FL." It is the operating time for the indicated function.

- 3) Message: ET FOR \_\_\_\_ INCLUDING L.T. = HR MIN SEC . xx
  - Explanation: This message is output when requested by the pseudo CLOK with P3 = "L" or "FL." It is the operating time plus load time for the indicated function.
- 4) Message: TOTAL E.T. FOR SEQUENCE = HR MIN SEC . xx

Explanation: This message is output when requested by the pseudo CLOK OFF. It is the ON-OFF time.

# d. Interrupt

The arithmetic interrupt messages are output on the logical unit specified on the function request. The number of messages output is controlled by the N2 control parameter on the function request.

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1)	Message: DIVIDE FAULT AT
	Explanation: This message indicates that a division by zero was
	attempted at or prior to the specified location.
2)	Message: SHIFT FAULT AT
	Explanation: This message indicates that a shift count greater than 127B was encountered at or prior to the specified location.
3)	Message: EXP OVF FAULT AT
	Explanation: An exponent overflow fault occurred at or prior to the specified location.
4)	Message: EXP UNF FAULT AT
	Explanation: An exponent underflow fault was encountered at or prior to the specified location.
5)	Message: OVRFW FAULT AT
	Explanation: An overflow fault occurred at or prior to the specified location.
CAR	DS
The	mode cards which may follow the CARDS pseudo are listed on the
	2 printer to provide a log of the events. This information is
	ful if an error occurs on the mode card or in one of its defini-
	n or corrector decks.
1)	Message: DEFINES
	Explanation: This message indicates that the specified function has been defined.

2) Message: CORRECT

Explanation: This message indicates that correctors have been made to the specified function.

3) Message: ENDCARDS

Explanation: This message indicates that no more cards follow the CARDS pseudo and is used only when CARDS is requested via the "successor call" function.

4. Information Messages Output on the Typewriter

There are two typewriter messages not accompanied by halts:

a. Message: TRANSMIT MODE IS BEGINNING

Explanation: This message is output after SERDTLK has been loaded into core to indicate that data will be transmitted to and from the 160A.

b. Message: TRANSMIT MODE IS TERMINATED

Explanation: This message is output after SERDTLK has been operated to indicate that the 160A-1604 transmission of data has been completed.

# 5. Error Messages

The "error indicative" messages are designed to inform the programmer of errors that have occurred in processing his job. These errors may be due to an illegal deck set up, to mis-punched cards or to the system limits that have been exceeded. These messages are output on the 1612 Printer (unless otherwise specified) and are spaced up so that they may be readily read. The control program then halts unless otherwise stated.

# a. Message: ERROR INCURRED ON CODED CARD

Explanation: An error has been encountered on a non-binary card in the deck following the CORRECT or DEFINES card which was previously logged. The card is in error for one of the following reasons:

- 1) An embedded blank was encountered in the location or a data field on an octal or decimal card.
- 2) An illegal character in an octal or decimal card.
- 3) An overpunch which indicates the sign or relocatability is in the wrong column.
- 4) A blank card or one which has an illegal punch in Column 1.
- 5) A digit is not in the first column of a decimal data field.
- 6) A field on a free field data card is incorrect.

Operator Action: The bad card should be flagged so that the card can be corrected readily. If it is desired to correct the card and continue, place the deck commencing with the corrected card and hit start.

# b. Message: SUM ERROR INCURRED ON BINARY CARD

Explanation: A binary card in the deck following the last DEFINES or CORRECT card that was logged has a bad check sum.

Operator Action: To ignore the error, hit start to process the card.

c. Message: BINARY CARD INSTEAD OF A DEFINES, CORRECTOR OR \* CARD

Explanation: A binary card was encountered while in the CARDS mode. This indicates that the deck is set up incorrectly and may be due to a double termination card, the last of which is binary.

Operator Action: The deck should be interrogated for correctness. Hit start to process next card.

d.	Message: ELEMENT REQUESTED WHICH IS NOT IN DIRECTORY, CODES =	
	Explanation: An element which is not on the Master Tape was referenced by a defined element or by a corrector.	
	Operator Action: To ignore corrector and to process next one, hit	

start. The corrector will not be entered into the corrector table.

e. Message: BAD MODE CARD

Explanation: Either a DEFINES or CORRECT card does not follow \* CARDS or the mode card has an incorrect field. The errors which result in this message are:

- 1) The non-binary card is not a DEFINES or CORRECT card.
- 2) A field on either mode card is omitted.
- 3) An illegal character in an octal field.
- 4) The element to be corrected is not on the Master Tape.

Operator Action: Hit start to ignore the bad card and search for a legal card. The deck should be interrogated for double termination cards. Note that the bad card was logged on the 1612 Printer.

f.	Message:	LENGTH	ON	DEFINES	()	IS	LESS	THAN	LENGTH	ON	TRANSFER
	CARD										

Explanation: The length of an element being defined by a binary deck is compared with the length on the binary transfer card. If the defined length does not provide ample storage for the element, the above message is output indicating the two lengths that were compared.

Action: Correct the length on the DEFINES card and re-run job.

# g. Message: ILLEGAL SIMULATION PARAMETERS

Explanation: This message is output if the input and output units are specified on the SIMTEST pseudo incorrectly or if exactly two or no parameters were not specified.

Action: Hit start to ignore the SIMTEST pseudo request or correct SIMTEST card.

# h. Message: OUT OF DEFINITION SEQUENCE

Explanation: The element that was out of sequence was referenced by a previous defined element prior to the new definition.

Programmer Action: Re-order the definitions so that an element is defined prior to being referenced by another definition.

# 1. Message: NOT ON LARII BINARY TAPE

Explanation: The element specified in the above message cannot be found by the DEFINES mode on the unit indicated on the DEFINES card.

Operator Action: Check the tape on the indicated unit to determine if it is the right one. If it is, this error is unrecoverable.

# j. Message: UNIT \_\_\_\_ IS ILLEGAL

Explanation: The decimal unit number specified in message is out of the magnetic tape range. The number was specified on either a REWIND or WEOF pseudo request.

Action: Correct card and hit start to process it.

k. Message: CODES NOT ON MASTER TAPE

Explanation: The CODES table, which is a separate record in COPII, is not on the Master Tape. This error is unrecoverable.

Operator Action: Notify the person who made the Master Tape so that the CODES table can be added.

1. Message: PARAMETER LIMIT EXCEEDED

Explanation: More than 75 parameters were encountered on a function request.

Action: Hit start to process the next function request.

m. Message: NOT FOUND

Explanation: The element indicated in the message was not found on the Master Tape or in the new routine list.

Action: Check the card for correct spelling. If it is correct, the error is unrecoverable. To ignore the request, hit start to process next one.

n. Message: UNIT NOT READY

Explanation: One of the MTCII I/O routines has encountered the indicated unit (number is in decimal) not ready. No halt is executed.

Operator Action: Ready specified unit and the cycle will continue.

o. Message: CARD READER (PUNCH) NOT READY

Explanation: The CARDIO routine has encountered the specified card equipment not ready. No halt will be executed.

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	Operator Action: Check the specified card equipment and ready it.
p.	Message: HAS EXCEEDED THE LIMITS OF CORE
	Explanation: The requested function and its environment has exceeded core. The two lengths are specified in the message.
	Action: Hit start to ignore the requested function.
q.	Message: PICKUP CANNOT BE PROCESSED
	Explanation: The ADDROF feature was utilized by a function which required more than 60000B cells of core. This cannot be handled since upper core containing MTCII has been destroyed.
	Action: Hit start to process next request.
r.	Message: ADDROF (SUCCFUN) REQUESTED DURING PTS MODE
	Explanation: The ADDROF and "successor call" functions cannot be utilized while in the Parameter Test Mode.
	Action: Hit start to proceed to next function request.
s.	Message: CARD READ STATIONS DO NOT AGREE
	Explanation: The image of a card at the primary and secondary read stations do not agree.
	Operator Action: To re-read the card, place the deck starting with
	the misread card in reader and hit start.
t.	Message: MORE THAN 20 ROUTINES DEFINED
	Explanation: The limit of the number of "newly" defined routines has been exceeded.

Action: Define elements only as they are needed instead of all at once.

u. Message: MORE THAN 100 CORRECTORS

Explanation: The limit of correctors has been exceeded.

Action: Use the CLR pseudo when possible to clear the corrector table.

v. Message: CARD READ NOT FUNCTION CARD

Explanation: A check is made to determine if a card is a function request. If not, a halt occurs rather than ignoring the card.

w. Message: FUNCTION WITH CODES = NOT ON MASTER

Explanation: A function specified by a CODES number in SPETABX is not on the Master Tape.

Action: Either add the function to the Master Tape or correct SPETABX.

x. Message: REDEFINING DIR ENTRY FOR ROUTINE NOT ON M.T.

Explanation: The name of the element on the REDEFINE pseudo is not on the Master Tape.

Action: Check REDEFINE card for an error in the name of element. Hit start to read next card.

y. Message: NOT IN SPETAB LIST

Explanation: The specified function references a SPETAB which indicates that sequencing is required but the function is not in the list of functions to be sequence checked.

	Action: Hit start to ignore request.
z.	Message: MORE THAN 1 TABLE SPECIFIED BY JOB ABANDONED.
	Explanation: The specified function references more than one SPETAB which is not possible. MTCII, Mod AG can be in only one SOM mode at a time.
	Operator Action: Hit start to process next request.
aa.	Message: N3 = FOR IS LESS THAN RESETC =
	Explanation: The starting location (N3) specified for the indicated function while in the SOM mode is in the reserved area whose upper limit is RESETC.
	Operator Action: Hit start to ignore the request and process the next one. The SOM mode will not be terminated.
bb.	Message: THE INCLUSIVE REQUIREMENTS FOR HAVE NOT BEEN  SATISFIED. THE FOLLOWING FUNCTIONS HAVE NOT BEEN OPERATED  SET A = O AND HIT START IF THE FUNCTION  IS TO BE OPERATED. HIT START IF FUNCTION IS NOT TO  BE OPERATED.
	Explanation: This message is output by the Sequence Check routine when in a SOM mode and a function does not satisfy its inclusive requirements.
	Operator Action: Self-explanatory

: ا

	. SET A = O AND HIT
START IF FUNCTION	IS TO BE OPERATED. HIT START IF FUNCTION
IS NOT TO BE	OPERATED.
Explanation: This me	ssage is output by the Sequence Check routine
when the specified fur	nction in the SOM mode has been operated out of
	• •
sequence.	

Explanation: An error has been encountered in the parameters N1-N4 on a function request. The error is one of the following:

- 1) N1, N2 or N3 is out of range.
- 2) N3 is specified as "CIANK" or "RCIANK" is misspelled.

Operator Action: The bad card should be flagged so that the card can be easily corrected. If it is desired to correct the card and continue, place the deck commencing with the corrected card in the read hopper and hit start.

6. Error Messages Output on the Typewriter

There are two typewriter messages accompanied by halts:

Message: MT NG a.

> Explanation: A parity, buffer length error, wrong ID or an EOF has been encountered in reading an element from the Master Tape.

Action: Mount the Master Tape on a different unit and re-run the request. If the error still exists, notify the person who made the Master Tape.

### b. Message: DIR NG

Explanation: This message is output when a parity or length error occurs in reading the directory record.

Action: Auto-Load and try to read the directory. If the error still exists, notify the person who made the tape.

#### 7. Halts Without Messages

There are three halts in the system not accompanied by messages:

#### a. Location: 00231B

Explanation: A halt will occur at this location if an \* FINIS card has been read.

Action: \* FINIS is sometimes used as the last card in a request deck to indicate to the operator that the job is complete. However, if additional function cards are in the reader, hit start to process the remainder of the deck.

#### b. Location: 00230B

1

Explanation: A halt will occur at this location prior to operating a requested function if SLS 1 is set.

Action: Hit start to operate the function or follow special instructions on the job request.

**~**~~

### c. Location: 70000B

Explanation: A halt will occur at this location if an \* HALT card has been read.

Action: \* HALT is used to allow operator action between operation of functions. Check the printer for instructions given via \* REM cards or follow special instructions given on the job request form. Hit start to continue.

#### 8. Optional Starts

#### a. Fresh Start

A fresh start implies that the control program is to be reloaded from the Master Tape. There are two ways to initialize the system:

- 1) Hit Auto-Load.
- 2) Push the CLEAR switch up and down, set P = 00010 and hit start.

#### b. Execution Cycle

If it is desirable to rerun the last function requested, push the CLEAR switch up and down, set P = 00213B and hit start.

#### c. Function Cycle

If it is desirable to read the next function request, push the CLEAR switch up and down, set P = 00260B and hit start.

#### 9. Initiation of System

The method utilized to load the control program from the Master Tape is to depress the Auto-Load button. (Auto-Load also clears console regs and I/O selections). This small button is located in the center of the Reader

and Punch Controls to the right of the console. Upon depressing the Auto-Load button, the internal circuitry selects the tape on Channel 3/4, Cabinet 2, Unit 1, stores the following instructions and executes them:

00000 74 0 32005 74 7 32000 00001 74 3 00002 74 7 32000

These instructions result in the selected tape being rewound and read into memory starting at Location 00002. After the bootstrap routine is loaded, a jump is made to that routine which loads the control program and Reference Pool from the second record of the Master Tape and transfers to the MTCII control cycle. Since the bootstrap and control programs occupy memory from 00000 to 07777B and the remainder of memory is used as storage area for the requested programs, the breakpoint should not be set to commonly used addresses, unless specified on the job request. The normal breakpoint setting is 77777 since this is the least used address. A breakpoint at 00000, which is not a null setting, will result in a halt prior to loading the bootstrap routine when Auto-Load is activated.

#### OPERATING PROCEDURES

### 1. Tape Mountings

In addition to the system tapes, mount tapes as specified on the job request.

Unit 1 - Master Tape - Mount the Master Tape specified, otherwise, use the M-1 CPDC Operational Master

Unit 3 - System Output - Mount a blank tape

### 2. Jump and Stop Settings

Set system switches, i.e.:

SLJ 1 - set - Typewriter control

SLJ 1 - un-set - Card control (standard mode)

SIS 1 - set - Halt prior to operating function

SLS 1 - un-set - Operate function (standard mode)

Set other selective jump and stop switches as specified on the job request.

### 3. Breakpoint

Set breakpoint to 77777 if not specified on job request.

### 4. Paper Tape

Ready the paper tape reader and/or punch as requested on the job request.

#### 5. Initiation Procedure

Initiate the system for one of the following input modes:

#### a. Card Mode

There are two cases in which it may be desired to start the system: a restart or an initial start. A restart may be accomplished by one of the following:

- 1) Position card deck in reader, ready reader and punch and start at 00260.
- Position card deck in reader, start at 00260 and ready reader, and punch.
- Start at 00260, position card deck in reader and ready reader, and punch.

To implement an initial start, one of the following may be employed:

- Position card deck in reader, ready reader and punch, and hit Auto-Load.
- 2) Auto-Load, position card deck in reader, ready reader, and punch.
- 3) Position card deck in reader, hit Auto-Load and ready reader, and punch.

In the card mode it is possible to encounter two types of errors:

#### 1) Card Reader Not Ready

When attempting to read a function request and the card reader is not ready, a message is printed and the control cycle hangs until the reader is made ready. However, if the reader is not ready when reading the cards following an \*CARDS card, MTCII will halt after printing the error indication.

The reader may be "not ready" under one of the following conditions:

- a) Output hopper is full.
- b) Input hopper is empty.
- c) Card jam.
- d) The output hopper switch is depressed.

### 2) Read Station Do Not Agree

The cards following an \*CARDS card are double checked for accuracy by the read routine which reads from the primary and the secondary read stations of the O88 Card Reader and compares the results. If a card is misread, the message "CARD READ STATIONS DO NOT AGREE" is printed and the control program halts. By replacing the misread card and the remainder of the deck in the reader, a restart may be effected by making reader ready and hitting start.

### b. Typewriter Mode - SLJ 1 in Up Position

The typewriter may be used to request any function on the master tape and all pseudos with the exception of the \* CARDS pseudo. The operating procedure in the typewriter mode is:

- 1) Position selective Jump Switch 1 in the up position.
- 2) Hit Auto-Load if a fresh start is desired or start at 00260 if it is desired to preserve the system's current condition.
- 3) The control program types an asterisk (\*) and shifts the typewriter to lower case and awaits operator action. At this time the operator must type the function request. Since the function request is in the free field format any number of spaces may occur between the fields of the request. After typing the request, a

carriage return must be initiated to indicate that the request is complete. Multi-line requests are allowed by using the continuation symbol (\$).

4) If an error is made in typing request, type an illegal character.
MTCII interrupts this illegal character and repeats Step 3. The illegal characters include:

Upper Case Lower Case

#### c. Magnetic Tape Mode

The \*TAPERD pseudo must be utilized to activate the operation of a function request deck from magnetic tape. This mode of operation is most efficient when large binary programs are to be defined. The steps for this mode of operation are:

- Prestore the function request deck off-line. The last card of this deck should be an \*TAPERD N P with N = 0 or 14 or an EOF.
   This will return control to the card reader or typewriter.
- 2) Mount prestored tape on some unit other than 1 and 3.
- 3) Using the \*TAPERD N P pseudo, call the prestored tape. N is the unit on which the prestored tape is mounted. P indicates that Unit N is to remain the input source until modified by another TAPERD pseudo or an EOF is encountered.
- 4) Start at 260B or hit Auto-Load.
- 5) If it is necessary to return to the card reader or typewriter (for debugging reasons) while in the tape mode, then go to 150B with SLJ 1 up to get typewriter control or SLJ 2 down for card reader control.

### d. Change of Modes

There are several ways to change from one mode to another as explained below:

1) Card Input to Typewriter Control

To change from the card mode to typewriter:

- a) Put Selective Jump Key 1 in the up position and start from 00260 if the computer is idle.
- b) Put Selective Jump Key 1 in the up position while reading cards and the next request will be from the typewriter.
- 2) Typewriter to Card Control

To change from typewriter to cards put selective jump switch in normal or off position and either hit the carriage return or start at 00260. A start at 00260 is effected by pushing the CLEAR switch up and down, setting P = 00260 and hitting start.

### 6. Operator Feedback

The output from a computer run consists of the following:

- a. Output from Tape Unit 3.
- b. On-line printer and typewriter results.
- c. Operator response information on the bottom of the computer request form. If the job does not run as the instructions specify, state the deviations and indicate the console registers if an unexpected halt occurs. If a loop occurs, note the registers included in the loop if possible.

#### 7. Inspect and Change

To inspect or change the contents of core from the console use the following procedure:

- a. Set P = 00232B, Index Reg 1 (B1) = location to be inspected. Start.
- b. Index Register 4 now contains the location specified, A and Q registers contain the contents of the location and  $Bl = B^4 + 1$ , the location to be examined next.
- c. If the contents of the location specified by B4 is to be changed, enter the change in the A register.
- d. Set B1 to the next location to be inspected and start.
- e. The A register is stored at the location specified by B4 and the cycle continues at b.

### 8. Emergency Procedures

If a program destroys the control program and a dump of the requested function is desired, the following action should be taken:

- a. Hit Auto-Load to re-load the system.
- b. Input function request to dump the desired area, with N3 = a location higher in memory than the area being dumped; i.e., \* 13 60000B DUMP 3 10000B 60000B.

#### CARD FORMATS

For those unfamiliar with IBM cards, the general characteristics of a card are:

- 1. A card consists of 80 columns and 12 rows.
- 2. A column runs up and down, whereas a row runs from left to right across the card.
- 3. Row 12 or Y is the top row on the card, Row 11 or X is the second row from the top, Row 0 is the third, Row 1 the fourth, etc. Row 9 is the last row on the card.
- 4. The bottom of a card is called the 9 edge.
- 5. Column 1 is generally used to identify the type of card: octal, decimal symbolic or column binary. Column 1 is the leftmost column.
- 6. Multiple punches may occur in one column. In the case of symbolic cards, the following is a table of multiple punches for the alphabet.

	1	2	3	4	5	6	7	_8	9
12	A	2 B K S	C	D	E	F	G	H	I
11	J	K	L	M	N	0	P	Q	R
0		s	T	U	V	W	X	Y	Z

Special punches commonly used are:

Punches	Equivalent
11, 4, 8	*
12	+
11	-
12, 3, 8	•
12, 4, 8	)

Punches	Equivalent
12, 3, 8	\$
0, 3, 8	,
0, 4, 8	(
4, 8	- (hyphen)
0, 1	/
3, 8	=
11,0	7
12,0	<b>+</b>

MTCII is equipped to read octal, decimal, free field, alpha-numeric or column binary cards when defining a routine or correcting an existing routine on the master tape. Column 1 is used to indicate the type of card, i.e., a 7 and 9 punch indicates a column binary card, a 9 punch indicates a decimal card, a 0 punch indicates an octal card, an = indicates a free field card and a 1, 2, . . . 8 indicates an alpha-numeric card.

### 1. MTCII 1604 Column Binary Card

8 1 1 2 2 3 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
---

Column(s)	Row	Meaning
ı	12	A punch indicates relocatable, no punch is for absolute.
1	11,0,1,2,3	Number of words of data on binary card.
1	7&9	Indicates card is binary if both rows are punched.
1	8	Indicates to ignore the checksum if punched; otherwise, verify the checksum.
1 2	4,5,6 All	15-bit binary loading address.
3-4		Checksum (24 bits).
5-8		If deck is relocatable, these four columns are the relocation control tags, two bits per data word. The first bit indicates whether the upper address of the data word is relocatable (no punch for absolute operand address). The second bit indicates the relocation tag for the lower address of that data word. The last column (8) is always blank.  If the card is absolute (no punch in Column 1, Row 12), Columns 5-8 represent the first data word.
9-12		First data word if relocatable card or second if absolute.

Column(s)	Row	Meaning
13-16		Second data word if relocatable card or third
		if absolute.
		<b>∔</b>
		•
		<b>i</b>
		•
77-80		Eighteenth word if relocatable or nineteenth if
		absolute.

A termination card is identified by a zero word count.

An ident card is identified by an octal word count of 37.

A binary card does not have to be filled; it may have a variable number of words.

When forming a word from 4 columns of bits, the 48-bit representation is:

Card Bits	Col. 1 12 1	Col. 2 12 1	Col. 3 12 1	Col. 4 12 1
Word Bits	47 36	35 24	23 12	11 0

# 2. MTCII 1604 Octal Card

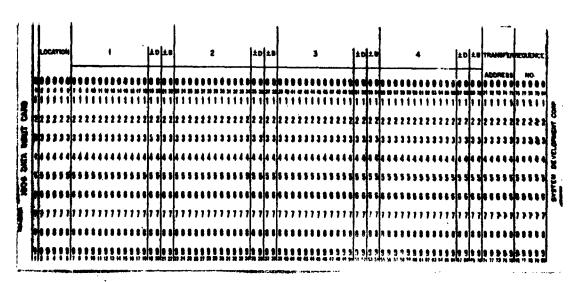
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Column(s)	Row	Meaning
1	0	Indicates that card is octal and must be punched.
1	12	Indicates last card if punched.
2-6		Octal load address.
2	12	If punched, indicates that load address is relocatable.
7-22		First data word.
7	11 or 12	A 12 overpunch indicates word is positive and an 11 overpunch indicates word is negative.
10	12	If punched, indicates upper address of first data word is relocatable.

Column(s)	Row	Meaning
18	12	If punched, indicates lower address of first data word is relocatable.
23-38		Data Word 2. An 11 or 12 punch in Column 23 signifies a - or + sign. A 12 punch in Column 26 or 34 indicates the upper or lower address is relocatable.
39-54		Data Word 3. An 11 or 12 punch in Column 39 signifies a - or + sign. A 12 overpunch in Column 42 or 50 indicates the upper or lower address of the word is relocatable.
55-70		Data Word 4. An 11 or 12 punch in Column 55 signifies a - or + sign. A 12 overpunch in Column 58 or 66 indicates the upper or lower address of this word is relocatable.
71-80		Not used.

All fields must be either fully punched or fully blank. Blank fields do not modify the storage location referenced. Words are loaded sequentially, relative to Word 1. If Columns 2-6 are blank, the data words are stored immediately following the last data word read.

# 3. MTCII 1604 Decimal Card



Column(s)	Row	Meaning
1	9	Flag that indicates that the card is decimal and must be punched.
1	12	If punched, it indicates the termination card.
2-6		Octal loading address.
2	12	If punched it means the load address is relocata- ble; otherwise, it is absolute.
7-18		Data Word 1.
7	11	Indicates first data word is negative.
7	12	Indicates first data word is positive.
19-20		Decimal exponent for Data Word 1.

Column(s)	Row	Meaning
19	12	Indicates decimal scaling is positive.
19	11	Indicates decimal scaling is negative.
21-22		Binary scaling for Data Word 1.
21	12	Indicates binary scaling is positive.
22	11	Indicates binary scaling is negative.
23-34		Same as described in Data Word 1, overpunch in
39-50		first column of data field indicates the sign
55-66		(12 overpunch for positive and 11 overpunch for negative).
35-36		Decimal scaling for Data Words 2, 3 and 4. A 12
51-52		overpunch in Column 35, 51, or 67 indicates the
67-68		scaling is positive and an 11 overpunch indicates negative condition.
37-38		Binary scaling for Data Words 2, 3, and 4. A 12
53-54		overpunch in Column 37, 53, or 69 indicates the
69-70		scaling is positive, whereas an 11 punch means negative.
71-80		Not used.

The data word must be left justified with the decimal point assumed at the far left of field. Fields may be filled out with blanks. If the number is to be converted to fixed point, the binary scaling field must not be blank. Fixed point numbers are rounded to the nearest whole number; i.e., .499 +0 +0 = 0 and .500 +0 +0 = 1. The binary and decimal scaling may be left or right justified; however, the sign punch cannot be part of the second character ( $\wedge$  1 \( \frac{1}{2} + 1 \).

# 4. Free Field Cards

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Column(s)	Content	Remarks
1	=	An = in Column 1 identifies this card as a free field card.
1	12 or 11 Punch	Either of these punches in Column 1 indicates that this is the last card of the DEFINES or CORRECT block.
2-6	Octal Address	This address is the location where the first information field is to be stored. All subsequent fields will be stored in successive locations.
2	12 Punch	A 12 punch over the first digit of an octal field indicates that the address is relocatable.

Column(s)	Content	Remarks
7-70	Information Field	Each information field, except the last one, must be terminated by a blank. Any number of blanks may separate a field and the first field may start in any column between 7 and 70.
71-73		Not used.
74-80	Identification	See FN-(L)-6561, Proposed Identification of Binary and Octal Decks.

There are four types of information fields: octal, decimal, BCI, BCI sentence:

### a. Octal

# 1) Instructions

	<sub>N</sub> 1 <sub>N</sub> 5 <sub>N</sub> 3 <sub>N</sub> 4	. 5 <sup>N</sup> 6 <sup>N</sup> 7 <sup>N</sup> 8  N9 <sup>N</sup> 10  N11  N12 <sup>N</sup> 13 <sup>N</sup> 14 <sup>N</sup> 15 <sup>N</sup> 16 <sup>B</sup>
Where:	_	
	Ni	Is an octal number; $0 \le n \le 7$
	$N_1 N_2$	Is operand of upper instruction
	$N_3$	Is B-Term of upper instruction
	N4N8	Is the M-Term of upper instruction
	$N_9N_{10}$	Is operand of lower instruction
	N <sub>11</sub>	Is B-Term of lower instruction
	$N_{12}N_{16}$	Is the M-Term of lower instruction
	В	Indicates that the field is octal

An overpunch over  $\mathrm{N}_{l\downarrow}$  or  $\mathrm{N}_{12}$  indicates that the address is relocatable.

2) Constant

$$+N_1N_2N_3 \cdot \cdot \cdot N_1B$$

Where:

$$1 \le i \le 16$$

$$0 \le N \le 7$$

B is the flag that indicates that the number is octal and must be present.

### b. Decimal

1) Floating

$$+D_1D_2 \cdot \cdot \cdot \cdot D_1D_1D_2 \cdot \cdot \cdot \cdot D_1E+D_1D_2 \cdot \cdot \cdot \cdot D_kS+D_1D_2 \cdot \cdot \cdot \cdot D_m$$

Where:

$$1 \le i + j \le 12$$

$$0 \le D \le 9$$

D<sub>1</sub> . . . D<sub>i</sub> Is decimal integer

 $\mathbf{D_1}$  . . .  $\mathbf{D_j}$  Is the fractional integer

E Is decimal scaling flag (optional)

 $\mathbf{D_1}$  . . .  $\mathbf{D_k}$  Is decimal scaling factor

Is binary scaling flag (optional)

 $D_1 \dots D_m$  Is binary scaling factor

A decimal point <u>must</u> appear following the D<sub>i</sub> term.

2) Fixed

$$^{+D}1^{D}2 \dots ^{D}1^{E+D}1 \dots ^{D}k^{S+D}1 \dots ^{D}m$$

Where:

Is decimal scaling flag (optional)

 $D_1 \dots D_k$  Is decimal scaling factor

S Is binary scaling flag (optional)

 $D_1 \dots D_m$  Is binary scaling factor

A decimal point must not be used.

### c. BCI

A<sub>1</sub>A<sub>2</sub>A<sub>3</sub> . . . A<sub>1</sub>

Where:

 $1 \le i \le 8$ 

A<sub>1</sub> Must be a character other than a number, comma, period, plus or minus

A<sub>2</sub>-A<sub>1</sub> May be any legal BCI (Binary Coded Information) characters.

#### d. BCI Sentence

 $(A_1A_2 . . . A_1)$ 

 $1 \le i \le 68$ 

A<sub>1</sub>-A<sub>1</sub> May be any legal BCI characters

# 5. Alpha-Numeric Card

				<b>a</b> .			A	-1	LV	L				A		N	2				A	-]	N.S	3			1	۹.	-1	<b>4</b> 1	•			A	۱-	N	5				ļ	۱	N	16				A.	-1	17				1	A.	-1	18	}				_	ľd			
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Column(s)	Content	Remarks
1	18	Is the word count for this card.
1	12 or 11 Punch	Either of these punches in Column 1 indicates that this is the last card of the DEFINES or CORRECT block.
) <b>2-6</b>	Octal Address	This address is the location where the data in Columns 7-14 will be stored. All subsequent fields will be stored in successive locations.
2	12 Punch	A 12 punch over the first digit of an octal field indicates that the address is relocatable.

Column(s)	Content	Remarks
7-14	Alpha-Numeric	May be any legal BCI character (including
15-22	Fields	blanks).
23-30		
31-38		
39-46		
47-54		
55-62		
63-70		
71-73		Not used.
74-80	Identification	See FN-(L)-6561, Proposed Identification of Binary and Octal Decks.

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#### SAMPLE JOBS

The following examples illustrate the types of function requests that may be encountered when operating the COPII System:

1. Operation of Functions from the Master Tape:

\*IRT 2 9 10

\*WNRT 2402 0 -4

2402 Data Package (BCD cards)

\*RUNNUM 2402 PRC5 - 21

\*DUMP 3 10000B 20000B

\*EOT 3

- 2. Definition of a New Routine that References Elements from the Master Tape and Correction of Reference Pool Items:
  - \* CARDS

DEFINES JOBA 200

Binary, octal and/or decimal cards

Termination card

CORRECT POOL

Octal, decimal and/or binary correctors

Termination Card

- \* 13 JOBA B C
- \* SYMDUMP 3 POOL JOBA

**\*EOT** 3

3. Redefinition of Existing Element:

\*CARDS

DEFINES TAPEDUMP 200

Binary, octal and/or decimal cards

```
Termination card
```

- \* TAPEDUMP 2 3 1 0 0
- **\* EOT** 3
- 4. Correcti .. of Existing Element:
  - \* CLR
  - \* CARDS

CORRECT IRT

Octal, decimal and/or binary correctors

Termination card

- \* IRT 2 9 10
- \* SYMDUMP 3 IRT COMMON
- \* EOT 3

Existing Element

- 5. Mixture of Corrections, Definition and Redefinition:
  - \* CLR
  - \* CARDS

	DEFINES WNRT 1200
Redefinition	Binary, octal and/or decimal cards
	Termination card
	CORRECT POOL
Pool corrections	Octal, decimal and/or decimal correctors
	Termination card
	DEFINES NEWROUT 357
Definition of	DEFINES NEWROUT 357    Binary, octal, and/or decimal cards
New Routine	Termination card
	CORRECT IRT
Corrections to	Octal, decimal and/or binary correctors

Termination card

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- \* IRT 2 9 10
- \* WNRT 2402 0 -4
- \* RUNNUM 2402 PRC5 21
- \* SYMDUMP 3 IRT WNRT POOL COP ZEROTEN
- \* EOT 3

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#### **GLOSSARY**

BCD Binary Coded Decimal is the four bit representation of numbers

from 0 to 9.

BCI Binary Coded Information is the six bit representation of

hollerith characters.

Bootstrap The routine that loads the MTCII Program into memory and

then transfers to its control cycle.

Breakpoint A console setting which provides for the selection of any

storage address as a breakpoint address. The computer stops when the program address (P) and the breakpoint address are equal, just prior to performing the upper instruction at the

breakpoint address.

Buffer A section of memory in the computer that has been set up

for storage of information, usually connected to input and

output.

Calling Sequence A set of computer words containing the parameters and entry

and exit locations needed to operate a closed subroutine.

CLANK The current location counter indicating where the next

routine will be loaded.

Clean Start An expression used in COPII indicating that the Bootstrap

Routine will load the MTCII Program into memory and start

at the beginning of the Control Cycle.

Closed Subroutine A subroutine which gets its data and makes its entry and exit

through a calling sequence.

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A table which contains the BCI names of elements. CODES

> is used by PMTII, LARII and MTCII for references to subroutines; i.e., the position in the CODES table of an element is its unique CODES number. This number is tagged relocatable by LARII and then PMTII and MTCII can deter-

mine what subroutine is being referenced.

Accepts a function request from the card reader, magnetic Control Cycle

tape, or typewriter and transfers to the loading cycle

for processing.

Control Parameters The parameters N1 through N4 on a function request.

COPII Control for Operational Programs II is the name for the

1604 system which is used to support the Satellite

Control Facility's activities. MTCII, Master Tape Control

II is the executive program for the COPII system.

Corrector A temporary octal, binary or decimal correction for an

element of the system.

A section of memory set up with a list or series of data Data Set or Table

points that are frequently looked at by a program.

Defined Routine An element temporarily entered into the system at execu-

tion time via the DEFINES mode.

A self-contained part of the COPII System (e.g., closed Element

subroutine, data table, buffer, etc.).

The character used to indicate a continuation of para-

meters to the next card of a function request.

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Equipment

The logical input/output unit (e.g., 0 for card reader, 1-12 for magnetic tape, 13 for printer, and 14 for typewriter).

Environment

All the elements required to operate a specific function.

Function

A closed subroutine which may be called and operated by a function request. This is possible only if the closed subroutine operates through a calling sequence which is compatible to the one generated by the COPII Control Program. A function may use other subroutines which are automatically brought in by COP when the function is called. The function must make consideration for the COPII generated calling sequence.

Function Request

A means by which a function and its elements are loaded and operated. The input source of a request may be card reader, magnetic tape or typewriter.

LARII

Lockheed assembly program II.

Library

The set of program elements contained on the master tape.

Map

Same as Storage Analysis.

Master Tape

A storage device for the COPII System containing elements of the system in absolute or relocatable binary records, MTCII, bootstrap and directory.

Mod

An optional mode of operation that is performed in a standard way, if not specified. These modification numbers appear on the function request preceded by parameters and a comma. MTCII The Master Tape Control Program II, which controls the

loading and operation of functions, is the executive

portion of the COPII System.

P Program address register on the 1604 console (15 bits).

Parameter Input data needed for the operation of a function or

subroutine.

PMTII Prepare Master Tape II program.

Program A function and all its necessary elements.

Program Element See element.

RCIANK Reset Location Counter indicating where the next routine

will be loaded while in the special operating mode.

Reference Pool That area of MTCII, available for programmer use, which

contains commonly used constants, variables and working

storage (COMMON).

Relocatable Binary information which will be loaded into core at its

Binary specified address plus a variable increment. All binary

cards are column binary.

Routine A set of computer words which performs a specific opera-

tion on specific data,

Storage A listing, made prior to loading the program, of all the

Analysis subroutines required to operate the requested function

and the starting addresses to which they have been

assigned,

Selective Jump

This console switch provides manual conditions for the SLJ instruction.

Selective Stop

(SLS)

A console switch which provides manual conditions for stopping the computer on the SLS (76) instruction.

Special Operating

Mod (SOM)

A mode of MTCII in which the sequence of functions is controlled by a special table and an area of memory is reserved as a communications buffer.

Subroutine

A set of computer words which performs a specific operation on generalized data.

Termination Card

A binary, octal or decimal card which signals the end of a group of correctors or of a subroutine.

TTTT Table

A table within the Reference Pool which contains information describing the current logical I/O unit configuration.

Unit N

A method used to make reference to equipment without knowing the equipment information such as channel, cabinet and unit number.

X

The fourth control parameter ( $N^{\downarrow}$ .) indicating to load but do not operate the requested function.

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BILEK, R. W.	22101	KOSTINER, M.	14056B
BLACK + H.	14039	KRALIAN, R. P.	14039
BRENTON. L. R.	24103B	KRISTENSEN, K.	SUNNYVALE
BURKE, B. E.	24086	LACHAPELLE, F. J.	22156
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CHAMPAIGN, M. E.	22091A	LEWIS, H. L.	22095
CHIODINI, C. M.	24082B	LITTLE, J. L.	24090A
CIACCIA. B. G.	24090B	LONG, F.	22078
CLINE, B. J.	24127	MADRID, G. A.	23014
COGLEY, J. L.	22122	MAHON, G. A.	24089
CONGER, L.	24082	MARIONI, J. D.	24076B
COOLEY, P. R.	24081	MARSHALL, R. D.	22099
COURT + T . D .	24086B	MARTIN, W. P.	24127B
DANT , G. B.	24086B	MCKEOWN, J. C.	22083
DECUIR, L. E.	24053A	MICHAELSON, S. A.	14039
DERANGO, W. C.	24094A	MILANESE, J. J.	22078
DEXTER, G. W.	25026	MUNSON, J. B.	22076 22096A
DISSE, R. J.	22082	MYERS, G. L.	14056A
DOBRUSKY, W. B.	22150	NELSON . P. A.	24075
ELLIS, R. C.	22131 A	NG, J.	22148
EMIGH, G. A.	14039	NGOU, L.	24127
ERICKSEN, S. R.	22113	PADGETT, L. A.	24110A
FELKINS, J.	24097	PATIN, O. E.	SUNNYVALE
FOSTER, G. A.	14039	PERRY, G. H.	24034
FRANKS, M. A.	24122	POLK, T. W.	24113
FREY, C. R.	23110	PRUETT + B . R .	22157
FRIEDEN, H. J.	23013	REILLY, D. F.	24121
GARDNER, S. A.	22160	REMSTAD, C. L.	25030
GREENWALD, I. D.	22116B	RUSSELL, R. S.	14054
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HARRIS, E. D.	24081	SEACAT, C. M.	SUNNYVALE
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HILL, C. L.	22161	SHAPIRO, R. S.	24110B
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HOLZMAN, H. J.	24065B	SPEER, N. J.	24085
HOUGHTON, W. H.	24103B	STONE, E. S.	24058B
HOYT , R. L.	14039	SWEENEY, M. J.	25030
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WEST, G. D.		ZACHTE, S. A.	24086
WEST, G. P.	22116A	ZUBRIS, C. J.	24075

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System Development Corporation, Santa Monica, California MASTER TAPE CONTROL II (MTCII) OPERATING PROCEDURES. Scientific rept., TM-745/001/00, by B. R. Pruett. 10 May 1963, 66p. (Contract AF 19(628)-1648, Space Systems Division Program, for Space Systems Division, AFSC)

Unclassified report

DESCRIPTORS: Programming (Computers). Satellite Networks.

Gives the level of detail necessary for programmers and computer operators to

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manipulate the COPII system efficiently. Includes a list of objectives of MTCII, a summary of the functions of the control program, a brief description of the system storage device, function requests and system control cards. Defines the input and output of the control program. Describes tape assignments, console switch settings, on-line messages, halts, starts and restrictions. Discusses the operating procedures for the MTCII system.

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